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# PATENT SPECIFICATION

Convention Date (United States): Sept. 11, 1936. **497,409**

Application Date (in United Kingdom): Feb. 27, 1937. No. 5965/37.

Specification not Accepted

COMPLETE SPECIFICATION

## Improvements in or relating to Methods and Means for Irrigating Plants in Pots and the like

I, HENRY CAMPBELL AVERY, a citizen of the United States of America, residing at 6, Upper Beverly Hills, County of Hampden, West Springfield, Massachusetts, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a mat or pad for irrigating or furnishing water to potted plants either in the household or in greenhouses. The mat hereof is intended to be used to good advantage to replace moist sand or cinders, such as are commonly used to cover the tables or benches of a greenhouse whereon potted plants are grown. The function of moist sand or cinders is to nourish the potted plant from the bottom by capillarity through the clay pot wall even when top watering is additionally performed, as it is well known to horticulturists that plants are best sustained by both top and bottom watering. Indeed, bottom watering is even more important than top watering because the root structure is most active at the bottom of a plant whereat the tender or hair roots largely occur. Under both bottom and top watering, the root mass becomes well distributed throughout the soil and hence gets the advantage of maximum all-round nutrition, especially moisture nutrition.

Plants successfully grown in a greenhouse and then sold to a householder are usually placed on a dry surface, such as an ordinary glazed saucer. They are watered periodically and with varying degrees of efficiency, but they are practically always under-watered for various reasons generally overlooked by the householder. Thus, the storage space between the top of the soil and the top rim of the pot is generally insufficient to carry much water and, when such space is filled, watering is perforce stopped in order to avoid overrunning the pot, despite the fact that the water thus supplied may be insufficient to reach the bottom roots in proper amount. Again, it is generally assumed by the householder that one watering a day is sufficient, as it may often be, but household conditions fluctuate so widely that damaging aridity during some days may occur particularly when the cumulative effects of strong sun, furnace heat, air-draft, etc. are at work. Again, incrustation of top soil to the extent of about one inch may take place, in which case penetration of water to the sub-soil may be so greatly diminished that most of the water may evaporate into the atmosphere either directly or through the pot wall without ever gaining access to the bottom roots. In extreme cases, the soil may have been permitted to dry or cake so badly that it has cracked away from the internal pot wall, leaving a fissure down through which water may flow quickly out through the pot bottom so as to accomplish very little soil wetting. In such cases, the pot wall is apt to dry out, insomuch that such moisture as is present in the soil tends to diffuse together with water-soluble plant nutriment into the pot wall, as is evidenced by the white deposit sometimes found on the outside wall, in contrast to the green moss or algy observable on thoroughly watered potted plants, such as those coming from greenhouses. When an improperly watered potted plant is knocked loose or removed from its pot, it discloses white massed roots penetrating outside of the soil against the internal pot wall; and this shows that the roots have followed the direction of diffusion of the moisture outwardly and have developed at such regions

[P

Price

while they have shrunken or disappeared altogether at the bottom. Contrariwise, a potted plant taken from a greenhouse and removed from its pot shows healthy roots well-distributed throughout the soil, which condition bespeaks a healthy and flourishing plant. The decline in the average greenhouse potted plant after being brought into the household is continuous and is often prematurely fatal to the plant.

The plant-irrigating mat of the present invention affords a continuous supply of capilliary or osmotic moisture through the bottom pot wall to substantially all the soil surrounding the plant roots, wherefore, as is true of potted plants grown on sand or cinder beds, the plant is not subject to over-watering and cannot die of excess bottom watering commonly known as "wet feet" or of excess top watering such as makes for muddied soil. The mat hereof is further characterized by its shape-holding ability, its capacity to be dried out repeatedly and reused, its freedom from malodor or putrefactive tendency, and its long useful life. Moreover, it has much greater absorptivity or water-retentivity than cinders or sand. Thus, whereas cinders retain only about 50% and sand only about 20% moisture, the mat hereof is capable of absorbing or retaining in excess of about 100% moisture, based on its dry weight.

In its preferred embodiment, the plant-irrigating mat hereof is a relatively thick leatherboard structure so fabricated as to afford good water drainage, that is, so that its upper surface is practically devoid of free or excess water when it is partially submersed in water. In other words, although water is capable of diffusing readily into and throughout the mat structure when it is placed in water whose level is below that of the top face of the mat, nevertheless the mat does not tend to become soft or soggy and thereby cause the roots of the plant to be exposed to free water, which, as already indicated, is fatal to the plant.

In the accompanying drawings,—

Figure 1 depicts in perspective a mat embodying the present invention.

Figure 2 shows the mat in use under a potted plant.

The mat *m*, as shown in Figure 1, is of substantial thickness, for instance, about one-half inch. It preferably has an irregular shape, for instance, one that includes, as shown, a plurality of curved edges *e* containing deep recesses *r* therebetween so as to present a large aggregate edge surface through which water may diffuse into and throughout the entire body of the mat when the mat is partially submersed in water. The mat area *a* inwardly of the recesses *r* is preferably sufficient to permit a pot to rest thereupon without any part of the bottom being out of contact with the mat surface. Of course, the size and configuration of the mat may vary, depending upon the particular size of the pot to be placed thereon. The mat *m* appears in Figure 2 on a saucer *s* containing a water supply *w* only partly submersing the mat; and the potted plant *p* rests on the mat with the pot bottom *b* making contact throughout with the upper mat surface.

While the mat hereof is preferably used in a saucer or tray as illustrated in Figure 2, it need not necessarily so be used, in which case, it should be kept well-wetted or saturated with water. This may be done by submersing the mat frequently in a water bath or wetting it under a water faucet; and when it is used under a number of potted plants on a drainage table or bench, as in a hot house, in lieu of sand or cinders, it may be hosed down at intervals with water.

By using the mat hereof in a saucer or tray, ample reserve of water for maintaining and stimulating plant growth is ensured under ordinary conditions. Thus, there is a supply of "solid" or free water in contact with the mat and a supply of capillary moisture throughout the mat structure and the pot wall. Such a water reserve does away with the need for frequent watering; and it is possible to sustain a plant for a period of many days without adding to the water supply. Such interrupted watering service may frequently occur in a household, as when the householder leaves for a week-end. The householder returning after a period of some days might find no free water in the saucer, but the mat would be moist and the pot wall only superficially dry, if at all. It is thus seen that the mat hereof enables plant sustenance and development without attention over substantial periods.

Boards or sheets for the mats hereof lend themselves to economical large-scale production with machinery of the paper-making type. Thus, scrap leather or leatherboard, preferably substantially free of cellulose fiber, is placed together with water in an ordinary beater or hollander engine and the engine operated for the comparatively short period of, say, about fifteen minutes to one-half hour, necessary to disintegrate the stock and reduce it to the desired pulp or feltable condition. The resulting aqueous suspension of leather fibers is then pumped to an ordinary wet machine, comprising a vat, a rotating cylinder or cylinder mold, and a couch roll around which passes an end-

less wool blanket leading to a make-up roll and a lower squeeze roll. The fibers are picked up or deposited from aqueous suspension as a thin web on the cylinder mold under suction and the web is carried out of the suspension into contact with the wool blanket which has greater affinity for the wet web of leather fibers than the wire cloth of the cylinder mold. At such region of contact, the wet web is transferred to the wool blanket, which carries it to the make-up roll consisting of wood or rubber, which in turn has greater affinity for the wet web than the wool blanket, in consequence of which the wet web is convoluted or accumulated on the make-up roll as a tubular layer of the thickness and density desired herein. The wet tubular layer, which may be of a thickness ranging from about one-quarter to three-quarters inches, is slit longitudinally and removed as a flat sheet from the make-up roll; and a number of such sheets are stacked between alternate layers of wool felt and the stack subjected to sufficient pressure to squeeze residual free water from the sheets. The pressed sheets are then dried as on steam-heated plates or by exposure to a heated atmosphere whose temperature is safely below that at which scorching of leather ensues. The dried sheets or boards are then tempered by being sprinkled with water much in the same way as clothes are dampened prior to ironing. Such moistening renders the sheets sufficiently pliant so that they may be ironed or smoothed out nicely as by passage through the polished steel rolls of a calender. The smoothed or calendered sheets may then be trimmed to the desired shape or died out into individual mats for use under individual potted plants.

It is possible to produce the mats hereof from fibers other than leather fibers, but I have found it preferable to use leather fibers therein as the preponderant or major fiber component. Thus, I have found that an all-asbestos mat or board tends to "pulp up" or disintegrate in the presence of free water, which tendency is accompanied by the presence of free or excess water on the top surface of the mat on which the potted plant rests. Accordingly, should asbestos fiber alone be used in the mats hereof, it is desirable to add thereto a suitable pore-forming substance, such as charcoal, which promotes the drainage of free water through the mats. Again, hair-felt boards may be used for the mats hereof, but these tend to rot and become putrid after a while under the action of water. While preservatives such as formaldehyde, beta naphthol, and phenols in general may be incorporated into hair-felt boards to minimize their putrefaction in the presence of water, yet it is generally preferable to avoid the presence of such chemicals in the mats hereof.

I have found that leather fibers may be advantageously compounded or blended with various fibrous and pulverulent ingredients for the purposes hereof. Thus, a subordinate proportion of asbestos fiber may advantageously be blended with a preponderant proportion of leather fiber to minimize such tendency toward curling as exists in an all-leather fiber mat upon prolonged submersion in water attended by repeated intermediate dryings. Again, when a substantial percentage of asbestos is blended with the leather fiber, such increased tendency toward sogginess as might otherwise exist in the finished mat on account of its asbestos fiber content may be offset or counteracted by adding along with the asbestos such ingredients as charcoal, sand, wool, hair, etc., which serve to "free" the stock, that is, to impart to the sheets or boards made from the stock enhanced water-draining ability. Thus, I have made mats satisfactory for the purposes hereof from beater furnishes or stocks made up by weight of 50 parts of scrap leather, 30 parts of asbestos, and 20 parts of very fine sand, e.g., washed beach sand. In lieu of the fine sand may be used such other pore-forming substances as charcoal, "Cellite," and kieselguhr; and in lieu of the asbestos and/or pore-forming substances mentioned may be used such fibrous materials as wool, hair, and peat moss. In all such cases, the proportions of the various ingredients used are such as to lead to a mat structure of the appropriate water-draining ability. It might again be noted that it is possible to make the mats hereof from a blend of asbestos and fine sand, but in such case it is desirable to add a certain amount of sizing material, such as rosin and/or wax sizes, to the mixture in the beater engine, as the size fixed or precipitated as ordinarily on the stock does not destroy the water-absorbency desired in the finished board while at the same time avoiding undue sogginess therein in the presence of free water.

Rather than forming the board for the mats hereof on a so-called wet or paper-making machine, the board may be molded from the various beater furnishes or stocks hereinbefore described in flat pressure-molds such as are commonly used for making molded wall boards. The molding of boards for the mats hereof offers the advantage that various ornamental effects may be created in the finished mats. For instance, crushed multi-colored pebbles, shells, ceramics, etc., may be promiscuously strewn onto and pressed into the

surface of the board to impart thereto a pleasing appearance while avoiding serious interruption of the drainage canals through which capillary water is intended to be transmitted to the pot bottom. Again, the surface of the board may during its molding be sprinkled with dyes, pigments, etc., so as to acquire an attractive mottled appearance.

While the mats hereof might contain cellulose fiber in addition to their preponderant leather fiber component, I prefer to avoid the presence therein of any substantial proportion of cellulose fiber, such as wood pulp, by reason of the fact that there is evidence of the undesirability of maintaining cellulose fiber in wet condition next to the soil or environment in which plants are grown. Thus, as decomposition of cellulose fiber takes place under the influence of water, it has been shown that the cellulose becomes a carrier or culture medium for bacteria of the nitrogen-consuming variety, which consume nitrogeneous nutriment destined for the plant and are thus inimical to plant growth. In the event that cellulose fiber is included in the mat-forming composition hereof, it is desirable to treat such fiber with a fungicidal chemical, such as sodium silico-fluoride ($Na_2SiF_6$), which inhibits the decomposition of the fiber and also the generation of the nitrogen-consuming bacteria or other spores, fungi and bacteria inimical to plant growth.

In making the mats hereof by the practices hereinbefore described, plant nutriment or fertilizers, such as phosphates, nitrates, etc., of comparatively low water-solubility may be incorporated into the body of the board either during the board fabricating operations or afterwards, which fertilizers tend in limited amount to be carried along with capillary water to the soil of the potted plant, thereby replenishing fertilizer in the soil as it is being consumed by the plant. The mats hereof further present the advantage that they can be made to any desired pH value to suit various kinds of plants, that is, plants thriving both in alkaline or acid soils. It thus becomes possible to provide mats affording corrective and/or stimulating values to the particular plants being served; and an expert horticulturist may readily prescribe various corrective and/or stimulating chemicals for the mats, depending upon the particular plants to be served thereby. The utility of the mats hereof hence extends beyond the mere irrigation of, or water furnishment to, potted plants thereby, for they afford media by which plants may be scientifically and commercially controlled, modified, or stimulated in their evolutionary cycle. It might be noted that the leather fibers themselves serve to release valuable fertilizing elements to the plants and further that the leather fibers, even when compounded with a comparatively large amount of inert materials, such as asbestos, sand, etc., bind together such materials so firmly that the mat does not tend to disintegrate or "pulp up" in water over a very long period of time and has the requisite toughness to withstand the weight of the potted plant, shipment, and rough handling, including the shock of being dropped onto a hard floor.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness, said structure being characterized by its ability to withstand without tendency toward disintegration over a very long period of time submergence in water attended by repeated intermediate dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

2. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

3. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component and presenting an irregular shape of large aggregate edge area for exposure to water, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

4. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber.

said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

5. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component, asbestos fiber, and a pore-forming substance, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

6. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component and asbestos fiber, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

7. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component and a pore-forming substance, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

8. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component and fine sand, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

9. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing leather fiber as its preponderant fibrous component and charcoal, said structure being characterized by its ability to withstand submergence in water and repeated dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed substantially only by capillary diffusion to soil of a potted plant placed thereupon.

10. As an article of manufacture, an irrigating mat for potted plants comprising an interfelted fiber structure of substantial thickness containing plant-fertilizing ingredient, said structure being characterized by its ability to withstand without tendency toward disintegration over a very long period of time submergence in water attended by repeated intermediate dryings while substantially maintaining its shape and its further ability to transfer water in which it is partially submersed along with said fertilizing ingredient substantially only by capillary diffusion to the soil of a potted plant placed thereupon.

11. A method of irrigating potted plants, which comprises placing such plants on a mat of substantial thickness comprising an interfelted fiber structure characterized by its integrity and shape-holding qualities under the action of water over a very long period of time attended by repeated intermediate dryings and its ability to transfer water in which it is partially submersed substantially only by capillary diffusion to the soil of such plant; and submersing said mat only partially in water.

12. A foundation for porous pots for plants comprising a dish-like container for providing a pool of water, and a water-absorbent solid mat supported in said container for presenting a pot-supporting surface above the level of the pool, with its body in said pool, said supported mat being adapted to carry the weight of a potted plant.

13. A moisture-providing support for porous pots for plants, comprising a normally flat solid water absorbent fibrous mat, said mat being capable of retaining its general form and of providing a solid fixed support for a potted plant when resting in a pool of water.

14. The method of providing water to the walls of a porous pot containing a growing plant which comprises supporting a hydrophylic solid in a pool of water with the top of the solid above the level of the pool, whereby the solid absorbs water and forms an elevated moist surface, and supporting a clay pot upon said solid in direct contact with said surface, where-

by the solid slowly lifts water from the pool and acts as a valve in transmitting water to the bottom of the pot for absorption thereby.

15. A method for irrigating plants in pots substantially as hereindescribed.

16. Means for irrigating plants in pots constructed or arranged and adapted to operate substantially as hereindescribed.

Dated this 27th day of February, 1937.

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Fig. 1.

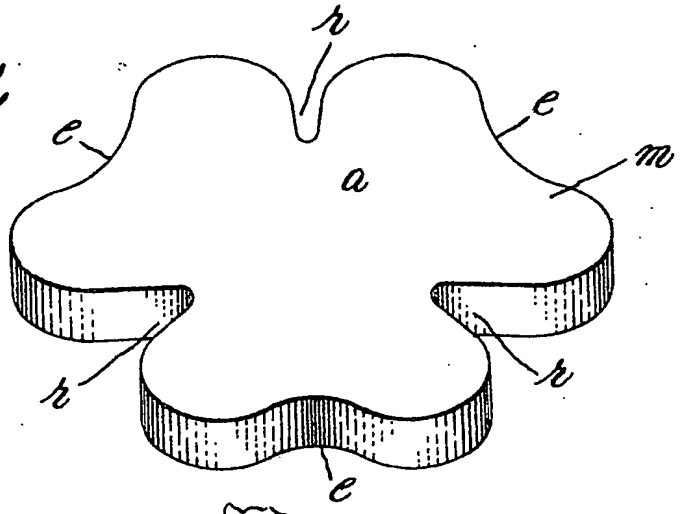
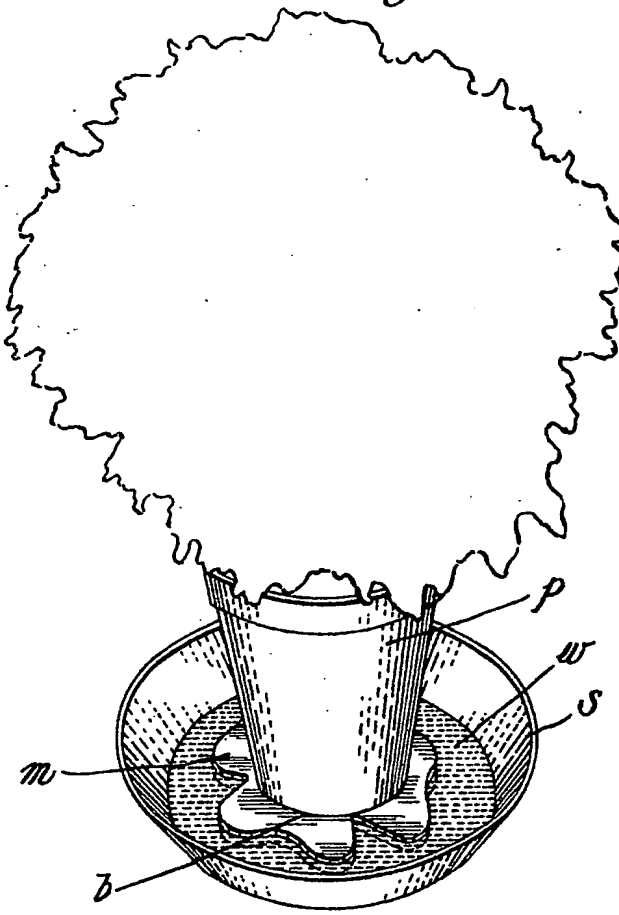



Fig. 2.

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